



# Using Simulink/System Generator for SDR Signal Processing Subsystems

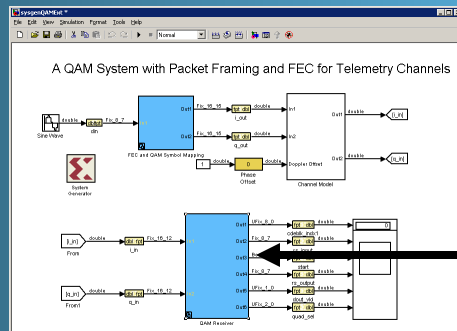
JTRS JPO Technical Workshop  
on DSP and FPGA Portability

29-30 April 2004

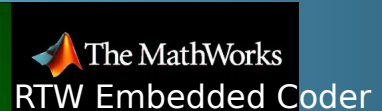
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# Platform FPGA Deployment



Automatic Code Generation



1. Develop Algorithm & System Model

RTL VHDL & Cores

3. Xilinx Implementation Flow



ANSI C

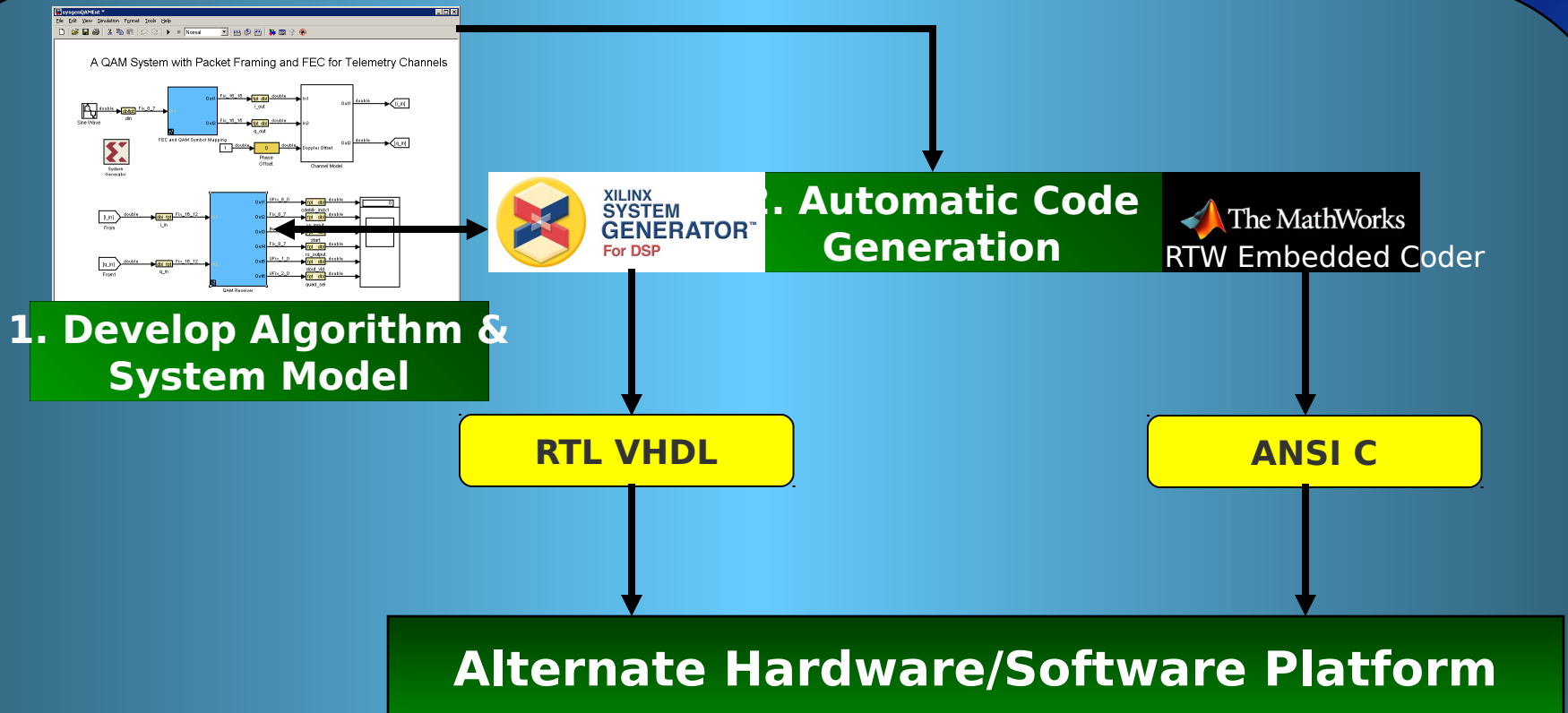


Bitstream

4. Download to FPGA



# Retargeting the Design





# SPS Function Interfaces

- Layered component portability for trading-off mobility vs. cost/performance
  - Waveform portable across FPGA/DSP/GPP based platforms
  - Different realizations of individual SPS functions may have variable mobility
    - AGC, DDC, DUC, Equalization, Carrier Recovery, Timing Recovery, FEC
  - High-level control and supervisory functions may have limited mobility
    - CORBA does not make sense at the level of a DDC
  - Function signatures define the narrowest compliant, and can be extended
    - Clock signals, bus interfaces should be optional
  - Implementation options controllable through
    - Hierarchical decomposition
    - System level attributes
- Hardware interface guidelines
  - Flow control and synchronization
    - Should be composable through self-synchronizing circuitry (GALs)
    - Retargetable functions require a granularity where self-synchronization is efficient and cheap
  - Port interfaces and functional description
    - Input/output relation, latency or real-time constraints, spectral mask, etc.

# Summary

- Platform-based design methodologies facilitate FPGA signal processing (COTS tools)
  - System specification and modeling
    - Simulink framework and language
  - Automatic code generation of hardware and firmware
    - System Generator for FPGA design of the SPS
    - Real-Time Workshop/Embedded Coder for firmware
- Need to establish hardware interfaces for data transport and control to support SPS function portability
  - Standardization a possibility, but will take time
  - Establishing guidelines and adopting recommendations in advance will be expedient
    - A good handshake goes a long way